THE INFLUENCE OF THE BUSINESS CYCLE ON CERTAIN SOCIAL CONDITIONS

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The influence of economic changes on social conditions has for a long time been a subject of study for historians, economists, and sociologists. We know that changes in the economic system of a people are accompanied by profound social changes. Thus, the industrial revolution of the past century brought changes in political organization, in the family, the position of women, industrial classes, education, etc. Such effects are the materials back of the theory of the economic interpretation of history.

There is, however, another type of economic changes which also occasions social modifications. These changes are not the lasting changes in the economic order but are oscillatory changes of short duration. Thus, while time brings enduring change, there are also brief swings in economic conditions through prosperity and depression, around the line of general economic change. These fluctuations in business conditions occur over short intervals with some regularity and are usually referred to as business cycles. Do these fluctuations in business produce fluctuations in social conditions? Do we find relatively more births, deaths, marriages, and divorces in periods of business depression? Does crime and do other social phenomena fluctuate with the business cycle? Of course the fact that social statistics fluctuate simultaneously with indexes of the business cycle does not necessarily prove a causal influence, that is, that the economic changes produce the social changes. For instance, if the birth rate is correlated with the business cycle, such a change in the birth rate may not be due directly to the business cycle but may perhaps be due to the changes in the marriage rate, which may correspond to changes in the business cycle. Our first problem, however, is to determine the amount of concurrence in the fluctuations of certain social conditions with the fluctuations of business.

It is possible to measure the amount of this concurrence in several social phenomena, for in some cases we have series of statistics going back a number of years. Furthermore, during the last few years a great deal of success has been achieved in describing the business cycle, and there also exists the technique for measuring quantitatively the concurrence in fluctuations in time series. In the following pages,

therefore, we shall inquire to what extent certain data of marriages, divorces, births, deaths, and crime vary with the indexes of the business cycle. Our first step is to measure the cycles of business during recent years.

I

One difficulty in getting a measure of the business cycles to correlate with social statistics for so large and varied an area as the United States is the diversity of our economic life. Our economic life consists in the main of agriculture on the one hand, and of manufacturing, mining, and trade on the other. The products of agriculture are affected in large part by rainfall and climate; oscillations in crops were in early times referred to as good years and lean years, famines being the extremes of the lean period. The business cycle is a phenomenon more characteristic of the period of great manufacturing development. However, during the last half century in the United States there has been a fairly close relationship between economic welfare in agriculture and in manufacturing. Prosperity and depression in business affect the profits from agriculture, if not so much the volume of agricultural production.

The problem of procuring data which are representative of the state of manufacturing and commerce has been already satisfactorily met. Business failures, prices, volume of production, banking data, and employment are sufficiently widely representative.

Representative indexes must also have one other attribute. They must fluctuate concurrently. The analyses, particularly of Persons and of Mitchell, show that there are a number of economic series that reach their maximum when general prosperity is at its greatest height and reach their minimum when business depression is at its lowest depth. There are also various other series which, when measured in months, reach their maximum at various intervals preceding or following the peak of general business prosperity. Years of research by various economists have resulted in an excellent description in quantitative terms of the cycle of business based on a combination of these representative synchronous series.

We wished to take a curve of the business cycle already constructed but could find none covering a sufficient number of years. Most of the curves of business cycles are for very recent years. Persons has carried his data back to 1879, and Axe has constructed a curve by months to 1877, though he has not published an account of how his curve was constructed. Since it was desirable to have as long a period as possible, we have constructed a curve from 1870 to 1920. In

TABLE I

SOCIAL DATA TO BE COMPARED WITH BUSINESS CYCLES

	1	2	3	4	5	6	7	8
	Number of persons married during year per 1,000 population for certain states	Number of divorces granted per 100,000 population for U. S.	Number of deaths per 1,000 population for selected states	Number of deaths of infants under one year of age per 1,000 births for selected states	Number of deaths from tuberculosis per 100,000 population for selected states	Number of births, including still-births, per 1,000 population for selected states	Number of convictions for criminal offenses in New York state	Number of suicides per 100,000 population in one hundred American cities
1870....	18.60	28	14.63	134.1	246	24.41	2,151	....
1....	19.06	29	13.97	118.8	235	24.46	2,340	....
2....	19.01	30	17.36	157.9	253	25.61	2,298	....
3....	19.34	31	16.76	141.0	246	26.99	2,919	....
4....	18.58	32	15.25	133.1	227	26.09	3,368	....
5....	16.92	32	15.77	135.9	242	25.31	3,420	....
6....	15.92	33	15.35	127.2	227	24.67	3,451	....
7....	15.56	34	14.36	120.3	227	23.94	3,827	....
8....	15.82	34	13.88	116.0	218	23.57	3,829	....
9....	16.34	35	14.13	117.1	209	22.63	3,216	....
1880....	17.42	39	14.94	125.4	215	22.38	2,847	....
1....	17.96	40	15.83	135.0	226	22.38	2,923	....
2....	18.74	42	15.24	125.0	217	22.74	2,887	....
3....	18.68	43	15.29	119.0	219	23.57	2,474	....
4....	17.42	42	15.10	132.3	217	23.34	2,315	....
5....	16.76	42	14.88	126.8	211	23.14	2,491	....
6....	17.28	44	14.61	131.1	207	23.07	2,860	....
7....	17.92	47	15.55	129.5	200	24.06	3,301	....
8....	17.76	48	16.17	135.0	201	24.37	3,243	....
9....	17.96	52	15.21	128.8	184	24.47	3,156	....
1890....	18.06	53	15.79	130.9	191	24.74	3,364	....
1....	18.40	55	15.96	133.2	174	25.38	3,607	....
2....	19.78	56	16.65	135.3	177	24.85	3,202	....
3....	18.20	56	16.23	136.1	171	25.23	3,283	....
4....	16.58	55	15.14	136.0	167	24.24	2,940	....
5....	17.50	58	15.45	134.4	171	24.22	4,468	....
6....	17.50	61	15.36	135.1	162	25.07	3,768	....
7....	16.66	62	14.42	124.0	153	24.17	4,523	....
8....	16.64	65	15.31	136.8	151	23.75	3,567	....
9....	17.34	69	16.00	137.1	146	22.68	3,861	....
1900....	17.80	73	16.69	156.8	144	23.09	4,116	15.4
1....	18.00	79	15.68	136.0	140	22.40	4,431	15.6
2....	19.58	78	14.96	132.2	130	22.56	4,516	16.7
3....	18.88	81	15.46	135.2	126	22.56	3,931	18.0
4....	17.78	81	15.11	130.0	132	22.74	4,685	18.7
5....	18.48	82	15.45	139.2	127	22.44	4,942	18.2
6....	19.48	86	15.62	136.5	123	24.47	5,143	16.8
7....	19.98	..	15.76	127.1	123	24.96	5,529	18.8
8....	17.56	..	15.02	125.4	116	25.62	7,351	21.5
9....	18.38	..	14.71	123.7	112	24.66	6,857	20.4
1910....	19.08	..	15.53	127.9	113	24.95	6,046	19.6
1....	19.22	..	14.81	112.9	108	24.99	6,657	20.4
2....	19.38	..	14.49	109.2	102	25.25	7,336	19.4
3....	19.64	..	14.58	106.5	101	25.47	7,765	19.7
4....	19.78	..	14.15	101.4	101	25.59	9,088	20.9
5....	19.18	..	13.98	95.3	102	25.63	10,158	20.8
6....	21.56	..	14.91	97.3	105	26.07	7,218	18.0
7....	22.22	..	14.93	92.3	107	26.39	7,930	16.7
8....	16.80	..	18.90	100.1	115	26.55	7,244	14.6
9....	21.00	..	13.43	86.3	94	23.94	8,047	14.3
1920....	23.06	..	14.02	88.8	84	25.04	6,856	12.3

TABLE II

CYCLES OF BUSINESS AND SOCIAL CONDITIONS

	1	2	3	4	5	6	7	8	9
	Cycles[1] of business indexes	Cycles of marriage rates	Cycles of divorce rates	Cycles of death rates	Cycles of infant death rates	Cycles of tuberculosis death rates	Cycles of birth rates	Cycles of crime rates	Cycles of suicide rates
1870	−0.15	+0.25	−0.91	−1.44	−0.20	+0.26	−2.33	+0.33	.....
1	+0.72	+0.76	−0.46	−2.28	−2.09	−0.76	−1.70	−0.24	.....
2	+1.15	+0.90	−0.07	+3.00	+3.34	+1.38	+0.45	−1.14	.....
3	+0.91	+1.18	+0.23	+2.23	+1.19	+0.81	+2.88	+0.02	.....
4	+0.25	+0.58	+0.49	+0.07	+0.23	−1.07	+2.12	+0.71	.....
5	−0.65	−0.88	−0.29	+0.95	+0.74	+0.83	+1.46	+0.56	.....
6	−1.18	−1.76	−0.20	+0.40	−0.38	−0.57	+0.94	+0.41	.....
7	−1.08	−2.03	−0.20	−1.07	−1.26	−0.34	+0.21	+1.19	.....
8	−1.63	−1.74	−1.01	−1.77	−1.79	−1.07	−0.07	+1.15	.....
9	−0.95	−1.21	−1.04	−0.95	−1.57	−1.82	−1.25	−0.23	.....
1880	+0.55	−0.15	+1.47	−0.12	−0.36	−0.83	−1.46	−1.03	.....
1	+0.73	+0.42	+1.30	+1.26	+1.03	+0.83	−1.39	−0.79	.....
2	+0.93	+1.18	+1.92	+0.30	−0.36	+0.13	−0.80	−0.75	.....
3	+0.52	+1.15	+1.63	+0.33	−1.21	+0.76	+0.42	−1.65	.....
4	−0.31	−0.02	−0.23	−0.02	+0.69	+0.94	0.00	−1.94	.....
5	−0.82	−0.63	−0.94	−0.47	−0.11	+0.63	−0.45	−1.51	.....
6	−0.19	−0.13	−0.85	−0.98	+0.47	+0.60	−0.76	−0.36	.....
7	+0.61	+0.48	+0.26	+0.33	+0.20	+0.18	+0.45	+0.85	.....
8	+0.53	+0.32	−0.20	+1.09	+0.92	+0.86	+0.63	+0.76	.....
9	+0.36	+0.50	+1.34	−0.49	−0.04	−0.88	+0.38	+0.56	.....
1890	+0.96	+0.56	+0.91	+0.19	+0.18	+0.65	+0.35	+1.06	.....
1	+0.70	+0.88	+1.01	+0.21	+0.42	−1.12	+0.42	+1.64	.....
2	+0.93	+2.14	+0.52	+1.23	+0.60	−0.05	−0.10	+0.43	.....
3	+0.02	+0.61	−0.59	+0.65	+0.60	−0.29	+0.69	+0.42	.....
4	−1.37	−0.96	−2.12	−0.95	+0.42	−0.47	−0.45	−0.60	.....
5	−0.52	−0.13	−1.53	−0.47	+0.07	+0.91	−0.17	+2.68	.....
6	−1.23	−0.20	−0.98	−0.56	0.00	+0.26	+1.32	+0.71	.....
7	−1.15	−1.03	−1.50	−1.91	−1.62	−0.47	+0.35	+1.96	.....
8	−0.73	−1.13	−1.01	−0.56	−0.11	−0.08	+0.07	−0.45	.....
9	+0.12	−0.53	−0.16	+0.53	−0.63	−0.18	−1.18	−0.26	.....
1900	+0.21	−0.20	+0.62	+1.63	+2.06	+0.18	−0.21	−0.17	−0.27
1	+0.19	−0.10	+2.28	+0.19	−0.43	+0.16	−1.01	+0.02	−0.52
2	+0.60	+1.26	+0.72	−0.81	−0.70	−1.04	−0.24	−0.29	+0.12
3	+0.26	+0.53	+0.91	+0.02	−0.07	−1.15	+0.14	−1.61	+1.08
4	−0.37	−0.56	−0.13	−0.44	−0.52	+0.73	−0.14	−0.81	+1.19
5	0.00	−0.05	−0.68	+0.19	+1.01	+0.39	−1.35	−0.82	−0.12
6	+0.52	+0.75	−0.13	+0.56	+0.96	+0.21	+0.90	−0.95	−2.20
7	+0.90	+1.05	.....	+0.88	−0.04	+0.83	+0.97	−0.72	−0.54
8	−0.97	−1.20	.....	−0.14	+0.11	−0.10	+1.35	+1.19	+1.79
9	+0.08	−0.60	.....	−0.48	+0.25	−0.44	−0.42	+0.24	+0.31
1910	+0.46	−0.12	.....	+0.91	+1.32	+0.34	−0.38	−0.97	−0.81
1	−0.17	−0.13	.....	−0.07	−0.52	−0.34	−0.63	−0.53	−0.10
2	+0.26	−0.13	.....	−0.42	−0.63	−1.30	−0.48	−0.05	−1.00
3	+0.34	−0.07	.....	−0.14	−0.58	−1.12	−0.35	+0.20	−0.52
4	−0.66	−0.10	.....	−0.65	−0.88	−0.70	−0.24	+1.36	+1.14
5	−0.70	−0.73	.....	−0.77	−1.37	−0.08	−0.21	+2.27	+1.85
6	+0.62	+1.06	.....	+0.93	−0.38	+1.04	+0.45	−0.68	−0.35
7	+1.08	+1.43	.....	+1.14	−0.63	+1.88	+1.04	−0.02	−0.48
8	+1.25	−3.11	.....	.....	+1.68	+4.27	+1.46	−0.64	−1.46
9	+0.35	+0.10	.....	−1.12	−0.25	−1.07	−1.80	+0.26	+0.46
1920	+0.81	+1.54	.....	+0.07	+1.19	−0.96	+0.07	−0.74	+0.50

[1] The cycles are in units of the standard deviation.

working out a single series to describe the business cycle we have chosen to combine the following series:

1. Wholesale prices, 1870–1915.[1]
2. Commercial failures, 1870–1920.[2]
3. Bituminous coal production, 1870–1920.[3]
4. Pig iron production, 1870–1920.[4]
5. Railroad freight ton mileage, 1882–1920.[4]
6. Bank clearings outside New York, 1881–1915.[5]
7. Employment in Massachusetts, 1889–1920.[6]
8. Railroad mileage constructed, 1870–88.[7]
9. Imports, 1870–88.[8]

These series have all been studied by others, and their yearly fluctuations are shown to have a high correlation [9] and to represent widely different types of economic phenomena. They are also probably sufficient in number to average out certain errors due to inadequacies in fitting trend lines and to such deviations of particular series from the true business cycle as may be found here and there.

The next step was to determine the cycles for each series. The data for most of these nine series when plotted showed a general upward movement for the whole period, with small fluctuations up and down around the line of the general upward movement. (A similar upward movement is seen in the curve of divorce rates shown in Chart III.) To each series lines were then fitted which appeared to describe the general movement. These lines are called the trend lines.[10] The actual data deviated in each year above or below these trend lines. (In Chart III, showing divorce rates, similar trend lines and deviations of the data from the trend lines are shown.) These deviations of the actual data from the trend for each year were computed in percentages of the trend data for the respective years. Then each percentage

[1] *U. S. Bureau of Labor Statictics, Bulletin 149*, p. 179; and *Monthly Labor Reviews.*

[2] The ratio of commercial failures to firms in business. Dun's Review. *Statistical Abstract of the United States.* Dun's figures of the number of firms in business.

[3] *U. S. Geological Survey, Mineral Resources of the U. S.*, 1917, p. 924 and later releases.

[4] *Statistical Abstract of the U. S.*

[5] *Commercial and Financial Chronicle.*

[6] Indexes of employment in manufacturing industries in Massachusetts. Ralph G. Burlin, "Three Decades of Employment Fluctuation," *The Annalist*, vol. 18, pp. 387–88, Oct. 24, 1921.

[7] *World Almanac*, 1922, p. 184.

[8] Value of Imports. U. S. National Monetary Commission, Statistics for the United States, 1867–1909.

[9] Warren M. Persons, "The Construction of a Business Barometer," *The Amer. Economic Rev.*, vol. VI, No. 4, Dec. 1916; and *Indices of General Business Conditions.*

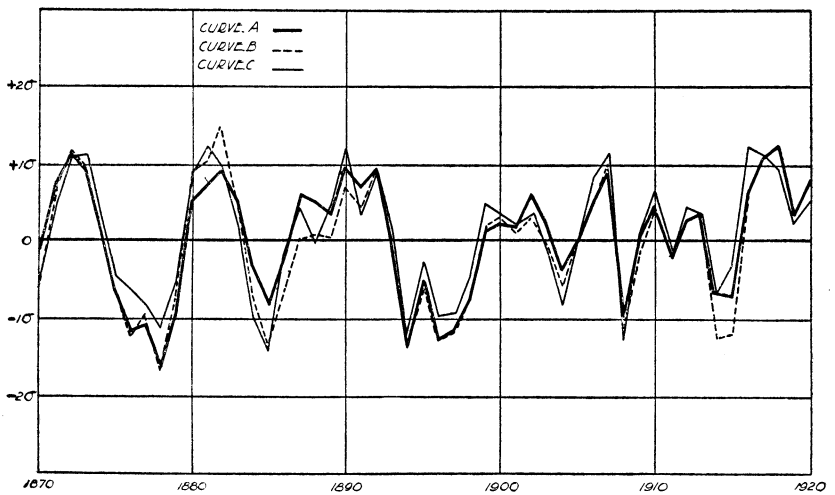
The Review of Economic Statistics (various issues).

[10] The trend lines for the various series are the following. The origins for these equations and all others listed are at the midyear of the period unless otherwise stated.

1. Wholesale prices, 1870–96, $y = 96.57 - 2.93x + 0.06636x^2$; and, 1897–1915, $y = 90.4 + 1.847x - 0.07335\,x^2$.
2. Commercial failures, 1870–1920, $y = 0.966 - 0.0043\,x$.

deviation was divided by the standard deviation of these percentage deviations for the particular series. The results were the cycles for the particular series in terms of their respective standard deviations as units. (Similar cycles for the divorce data are seen in column 3 of Table II.) The arithmetic mean, unweighted, was then found for the cycles of the nine series. The result is a single series describing the business cycle for the period and is seen plotted as curve A in Chart I. The indexes of the cycles are listed in column 1 of Table II.

In constructing this curve showing the fluctuations of business for



CURVES OF BUSINESS CYCLES

CHART I

the past fifty years, the chief methodological difficulty was in selecting the equations of the trend lines that seemed to describe best the general movement of the particular series. As there was no mechanical test to show which particular line best described the true trend of the data, it was largely a matter of judgment of the eye. For instance, one investigator might think that the trend of wholesale prices from

3. Bituminous coal production, 1870–1892, $y = 7760.8 + 631.22x + 19.41x^2$; 1902–14, $y = 37374 + 1673x - 54x^2$; and 1914–20, projected.
4. Pig iron production, 1870–94, $y = 4218.34 + 306.02 + 6.53x^2$; 1894–1904, $y = 12888.09 + 1140.96x$ 1904–14, $y = 24298.81 + 785.79x$; and 1914–20, projected.
5. Freight ton mileage, 1882–1914, $y = 120.88 + 8.076x + 0.2009x^2$; and 1914–20, projected.
6. Bank clearings outside New York, 1881–1915, $y = 31389 + 1982.54x + 56.23x^2$.
7. Employment, 1889–1905, $y = 62.47 + 1.818x + 0.1644x^2$; 1905–15, $y = 95.91 + 1.35x$; and 1916–20, projected.
8. Railroad mileage constructed, 1870–88, $y = 5754.37 + 236.3x$.
9. Imports, 1870–88, $y = 5691 + 108x$.

1870 to 1896 was that best described by a straight line, and another investigator might prefer a parabola.

In order to get around this difficulty of individual bias, which as a source of error, however, may be limited, we decided to check our results by constructing another curve of the business cycle by computing the cycles of each series from trend lines consisting of nine-year moving averages.[1] This was done, and the result is curve B in Chart I. It is seen to be remarkably similar to curve A, the coefficient of correlation of the two curves being +0.95.

Because of the fact that there may be a variation in preference on the part of different investigators in choosing equations to describe trends, it is of value to compare our curve of business cycles, curve A in the chart, with the curve constructed by Axe. Axe's curve is not constructed from identically the same series,[2] and it is for intervals of a month. It was reduced to a yearly basis by adding the monthly cycle indexes and dividing by twelve. As this curve goes back only to 1877, we pieced it out by joining on a cycle from 1867 to 1877 constructed from several economic series available for those years.[3] The resulting curve, thus extended, is plotted as curve C in Chart I. It is quite similar to curve A, the coefficient of correlation being +0.92.

From the foregoing considerations, then, we think that the cycle

[1] The moving averages were plotted at the midyear of each nine-year period. The trend lines of moving averages extended over the following years for the various series:

1. Wholesale prices, 1867–1912.
2. Commercial failures, 1868–1914.
3. Bituminous coal production, 1867–1916
4. Pig iron production, 1867–1916.
5. Railroad freight ton mileage, 1887–1916.
6. Bank clearings outside New York, 1884–1911.
7. Employment in Massachusetts, 1893–1916.
8. Railroad mileage constructed, 1867–86.
9. Imports, 1871–92.

[2] Axe's curve was published in the *New York Evening Post*, Oct. 17, 1921, in an article by Wesley C. Mitchell. The curve was not described, the trend lines not given, nor the years covered by the various series. The series combined in the curve were weighted with the following weights:

Bank clearing outside New York	25
Pig iron production	20
Railroad traffic	15
Failures	10
Copper production	5
Cotton consumption	10
Coal production	5
Commodity prices	10
	100

[3] The segment from 1867 to 1877 was constructed by averaging the cycles derived from straight-line trends for the following series: Railroad mileage constructed; imports and exports (fiscal years); immigration (fiscal years); pig iron production; bituminous coal production; commercial failures; wholesale prices; cotton consumption. The standard deviations for this segment are based on yearly data, while for the series in Axe's curve they are based on monthly data. There is, for this reason, perhaps some error in joining the two curves, but it does not appear to be large.

series in column 1 of Table II is a sufficiently satisfactory measure of the business fluctuations from 1870 to 1920 to use in correlation with the data of certain social phenomena.

II

For a study of the variations in marriage rates the only data that have been collected for the United States as a whole are from 1866 to 1906. Since it was desirable to have a longer record, we have collected the figures for the number of persons married during the year for the period 1870–1920 for the states for which satisfactory statistics were available. These states are Connecticut, Massachusetts, Michigan, New Hampshire, Rhode Island, and Vermont. The rates [1] for these states are listed in column 1 of Table I. A parabola [2] seems to describe the general movement of the marriage rates as seen in Chart II. The fluctuation of these marriage rates around the trend appears to be, in general, concurrent with the cycles of business indexes, as is seen by comparing the marriage cycles listed in column 2, Table II, with the business cycles listed in column 1, the coefficient of correlation being +0.66. Although in general the marriage rate increases in prosperity and diminishes in depression, this is rather noticeably not true in the year 1918. The marked drop in the marriage rate in this very prosperous year is thought to be due to the extraordinary conditions of war time. If we omit from the correlation table the data for the year 1918, the correlation becomes +0.87. When the cycles of marriage rates are computed from a trend of nine-year moving averages their correlation with the business cycles for 1874–1916 is +0.81.

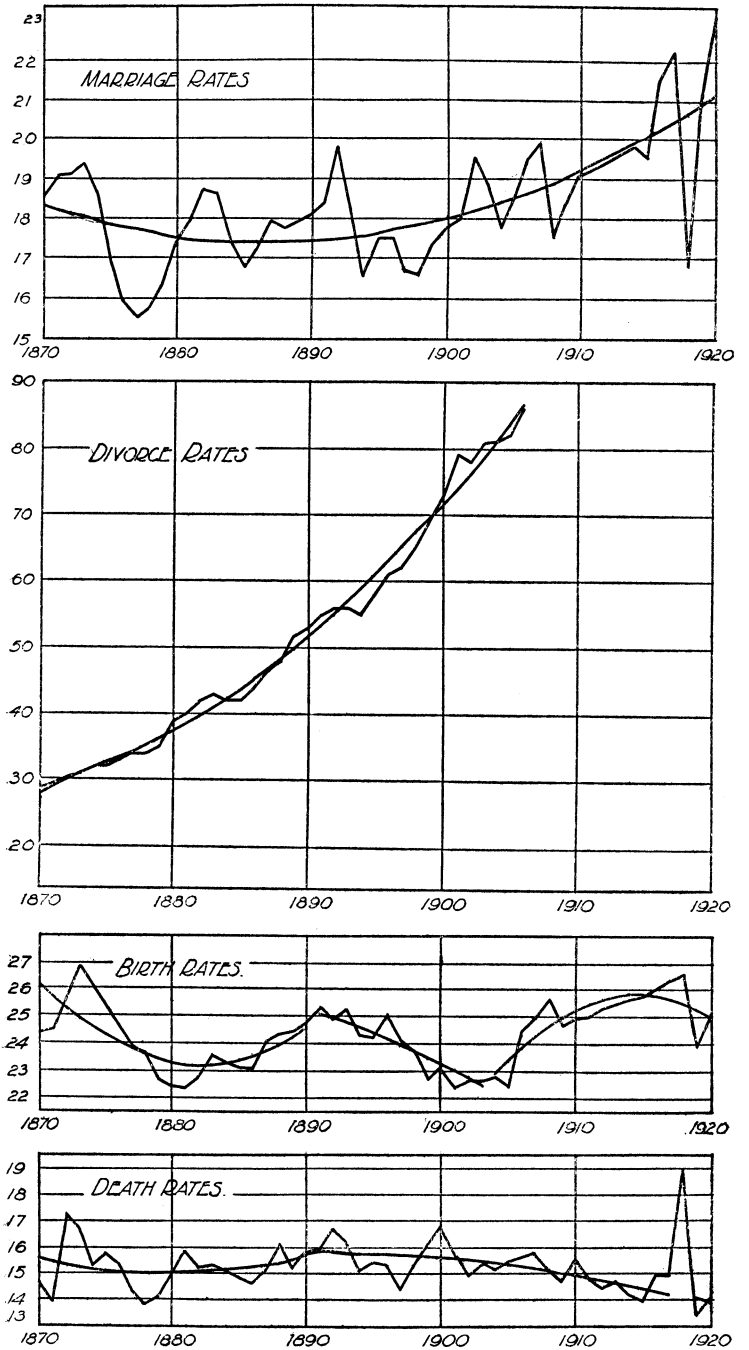
Similar results have been found by others. In 1901 Hooker obtained a coefficient of correlation of +0.86 between the marriage rate in England and Wales and the amount of foreign trade for the period 1861–95, the cycles being measured from seven-year moving averages.[3] For the United States, Davies found a correlation between the marriage rate and wholesale prices, 1887–1906, of +0.67.[4] This checking of results from different data by different investigators leaves no doubt as to the fact that the number of marriages fluctuates with business conditions.

[1] The population of these states, used in computing the rates, was found by interpolation for the intercensal years, on the assumption of a constant rate of change. During the last decade when the changes in population were somewhat unusual, the results of the state censuses helped in making the interpolation.

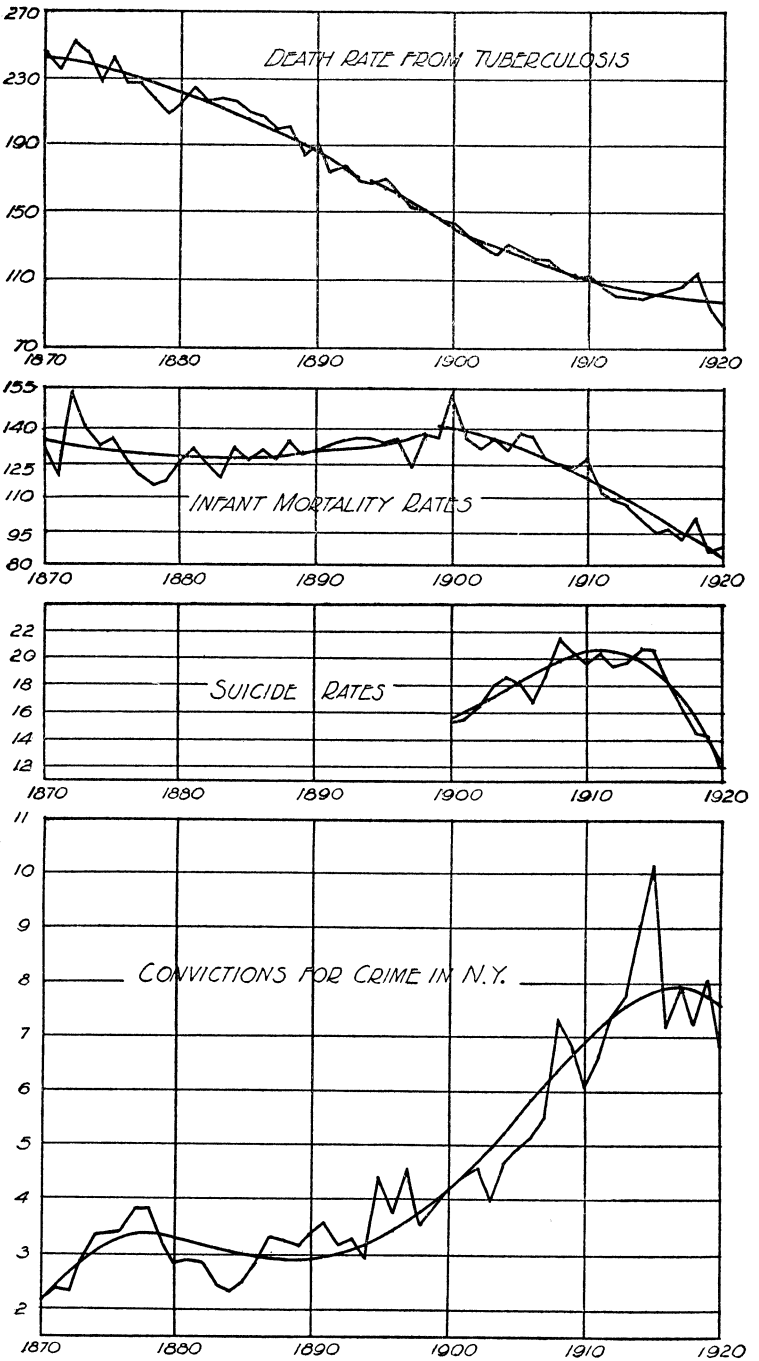
[2] $y = 17.65 + 0.055\,x + 0.0032\,x^2$.

[3] R. H. Hooker, "On the Correlation of the Marriage Rate with Foreign Trade," *Jour. of the Royal Statis. Soc.*, vol. LXIV, p. 485.

[4] George R. Davies, "Social Aspects of the Business Cycle," *Quar. Jour. of the Univer. of N. D.*, vol. XII, No. 2, Jan., 1922.



CHARTS II, III, IV, AND V



CHARTS VI, VII, VIII, AND IX

That the marriage rate should be greater when business is good and less when business is bad appears to be what one would expect. Yule thinks that one reason for the very large degree of correlation is probably the fact that the non-occurrence of the event in a business depression means in many cases only a postponement until business prosperity returns. The changes in the marriage rate seem to be practically simultaneous with changes in the business cycle. When the correlation is made between the indexes of the business cycle and changes in the marriage rates, not of the same year but of the following year, the coefficient of correlation (omitting the data for 1918) is +0.62, smaller than the coefficient when the correlation is made without the assumption of a one-year lag. Hooker finds that the correlation is a maximum with a lag of about a third of a year. The correspondence in the fluctuations of the marriage rate and the business cycle seem to be a little closer for the earlier years than for the later year, from both the British and the American data.

III

That the divorce[1] rate is influenced by business conditions was noted by Willcox[2] as early as 1893. The curve of divorce rates for the United States from 1866 to 1886 showed low divorce rates in the periods 1873–79 and 1884–86, which Willcox observed were periods of depression in trade. The similarity in the drops in the curve of divorce rates and the curve of trade was so close as to lead to the conclusion of a causal relationship.

Since the publication of Willcox's article, the divorce statistics for the United States have been extended to 1906. There has been a marked increase in the divorce rate, as is seen in the Chart III. Chart III also shows the trend line describing the upward movement.[3] The fluctuations around this trend line correspond quite closely to the fluctuations of the business cycles, the correlation for the forty years, 1867–1906, being +0.70.[4]

The tendency to secure more divorces in prosperity and fewer divorces in business depression is quite marked, and this conclusion is perhaps surprising. The reason is not clear, although the economic argument is clearer than the psychological. The fact that divorces are expensive, involving lawyers' and court fees and perhaps alimony, may

[1] We are indebted to Miss Helen Mack for assistance in the study of divorce rates and the business cycle.

[2] Walter F. Willcox, "A Study in Vital Statistics," *Polit. Sci. Quar.*, vol. VIII, No. 1.

[3] $y = 46.685 + 1.542\,x + 0.0289\,x^2$.

[4] The business-cycle curve used in this correlation was constructed from nine-year moving-average trends.

be the reason for relatively more divorces in times of business prosperity. It would be interesting to know whether there are also more desertions in periods of prosperity. It would also be interesting to know what psychological factors are involved in decreasing the divorce rate in times of business depression.

On account of the fact that time is involved in the court procedure of granting divorces, we might be led to expect a lag in the variations in the divorce rate corresponding to the business cycle. The correlation is, however, lower with a one-year lag in the divorce rates, being +0.58.

We have been able to procure the divorce rates for thirteen states [1] through 1920. The correlation between the business cycles for the United States and the divorce cycles for the thirteen states is lower (+0.33) than the correlation between the former and the divorce cycles of the United States as a whole for the shorter period. The lack of correspondence between the divorce cycles of the thirteen states and the business cycles appears to be greater for the earlier years, however, than for the later years. Also, from an inspection of the curves of divorce rates as published in the census volumes for separate sections of the United States, such as the South Atlantic States and the North Central States, it appears that there is a less close correspondence in fluctuations with the business cycle than there is for the nation as a whole. Just why these samples should show lower correspondences than the whole, we do not know. Possible causes may be changes in laws, migrations, changes in residence, or the influence of crop cycles.

IV

Statistics of the annual death rate for the registration area go back only to 1900. We were able to obtain the death rates from 1870 to 1920, however, for the same states for which we secured marriage rates. The fluctuations in the curve of these death rates seem to correspond somewhat with the business cycles. The correlation [2] is found to be positive and fairly high, $r = +0.57$, and with cycles from nine-year moving averages, $r = +0.63$. This is a surprising result, as one would guess that if there were any correlation at all between business conditions and death rates it would be negative, that is, there would be relatively more deaths in business depression and fewer in business prosperity. Such an inference would be drawn, for instance, from the studies of the Children's Bureau, Washington, D. C.,

[1] Conn., Ind., Ia., Me., Mass., Mich., N. H., Ohio, R. I., S. D., Utah, Vt., and Wis.

[2] The trend lines for the death rates from which the cycles were computed are, for 1870–90, $y = 15.01 + 0.0035\,x + 0.0062\,x^2$, and for 1891–1920 (omitting 1918), $y = 15.33 - 0.0654\,x - 0.0022\,x^2$.

which have shown that when the earnings of the father are low, the infant death rates are high. We are also told that pulmonary tuberculosis is a disease of poverty. The impression that disease is more prevalent in conditions of poverty would lead one to expect more deaths in business depression.

Assumptions of lags do not clarify the matter. With a one-year lag in the death rate the correlation is +0.49, and with a two-year lag it is +0.03. If we assumed a four- or five-year lag or longer in the influence of the business cycle on the death rate, we should probably get a negative correlation. But what basis is there for such an assumption? Such an assumption would be quite unjustified in the case of infant death rates. Yet the curve of infant death rates for these states is quite similar to the curve of general death rates. Yule has found a correlation of +0.77 between the general death rates in England and Wales and the infant death rates.[1]

The infant mortality rate shows about the same positive correlation with the business cycle as does the general death rate, +0.42, for the same states and for the same period.[2] The correlation, when the trend is nine-year moving averages, is +0.37. And with a one-year lag in the infant mortality rates the correlations are, for these types of trends, +0.43 and +0.29. The infant mortality rates, then, like the general death rates, show the strange result of increasing in prosperity and decreasing in depression.

If the registration bureaus were in the habit of collecting and registering more records in good times and fewer in bad times, this positive correlation would be explained; but persons familiar with the administration of vital statistics assure us that there is no such variation in the registration of death records.

We know that the filing of death records for all deaths does not occur. It has been a long, hard struggle to induce the various states to keep records sufficiently complete to entitle them to be included in the registration area. But even if the statistics of deaths are much less than 100 per cent complete, the partial records might quite conceivably show much the same cyclical fluctuation around a trend that they would if the records were complete. On the other hand, errors in the record may be due to various causes.

It may be that the death rates for the registration area since 1900 are more accurate than the death rates for the selected group of states from 1870 to 1900. We have therefore correlated the death rate for

[1] G. Udny Yule, *Introduction to the Theory of Statistics*, Chap. V, p. 198.

[2] The trend line for the infant mortality rate from which the deviations were measured for correlation with the business cycle is, for 1870–98, $y = 127.47 + 0.067\,x + 0.0466\,x^2$; and, for 1898–1920, $y = 122.04 - 2.73\,x - 0.072\,x^2$.

the United States registration area, 1900–20, with the business cycle for that period with the same results, $+0.44\pm0.12$ for the general rates, and $+0.41$ for the infant mortality rates.[1]

On account of these unexpected results it is desirable to see if they are borne out by statistics for other countries. We have not found any published results of correlations by other investigators of death rates and business conditions. We did, however, examine the mortality rates in England and Wales where the registration of vital statistics has been exceptionally satisfactory. In the absence of a curve of business cycles for England we used as our index of business conditions the amount of foreign trade.[2] The correlation, for the period 1870–1914, of foreign trade with the general death rate is $+0.02$, and with the infant mortality rate is -0.09. These results increase our skepticism regarding the existence of a significant correlation between death rates and the business cycle.

Even if there is no correlation of the business cycle with the general death rate, there might be a correlation with specific death rates, although inspection of the curves of some of the classifications of death rates since 1900 does not encourage such an expectation. For the United States, the fact that few states have records going back to 1870 and that only a small number of cases of deaths from specific diseases is recorded makes an inquiry somewhat doubtful. We have, however, correlated the cycles[3] of death rates from tuberculosis of the lungs for certain states[4] with the cycles of business, for the period 1870–1920, and find a correlation coefficient of $+0.32$. If the year 1918 is omitted the correlation becomes $+0.24$, and with a one-year lag it is $+0.16$. For the United States registration area, 1900–20, the correlation is $+0.193$; omitting 1918, it is -0.05.[5] The relationship of death rates from pulmonary tuberculosis to the business cycle is much the same as that of the general death rate.

The suicide rate would be expected, we think, to vary with business prosperity and business depression, and so it does. We have taken the suicide rate as computed by Hoffman[6] for one hundred cities of the United States for 1900–20 and correlated the suicide cycles[7] with

[1] The trend for the general death rate, 1900–20, omitting 1918, is $y=14.69-0.192\,x+0.00025\,x^2$, and for the infant mortality rates, determined by dividing the deaths by the population, is, 1900–20, $y=271.5-6.86\,x-0.05\,x^2$.

[2] The trend line for the foreign trade is $y=716.4+14.5\,x+0.596\,x^2$. The trends for other British data were taken from nine-year moving averages.

[3] Trend, 1870–94, $y=216-3.14\,x-0.72\,x^2$; and 1894–1920, $y=119.2-2.8\,x+0.086\,x^2$.

[4] Mass., Mich., N. H., and R. I.

[5] Trend $y=142.7-3.4\,x+0.034\,x^2$.

[6] Frederick L. Hoffman, "Suicide Record for 1920," *Spectator*, March 9, 1922.

[7] The suicide cycles were measured from the trend line $y=20.35+0.171\,x-0.0656\,x^2-0.00348\,x^3$.

cycles of business conditions for the same period, and we find a correlation of -0.74 ± 0.07.

From the inquiry, as thus far conducted, into a possible correlation between death rates and business cycles, we do not draw the definite conclusion of a correlation, except in the case of suicides. The evidence for the United States points toward the conclusion that there are somewhat greater death rates in prosperity than in depression; but the British data do not bear out such a conclusion. Although it seemed probable that there would be a negative correlation between death rates and the business cycle, it should be remembered that there are other factors affecting the fluctuations of death rates from year to year. Such factors are climate, health education campaigns, developments of preventive medicine, and epidemics. In a period of fifty years there are only a very few cycles, and if there is an economic influence it might be obscured by variations in other factors, although it could be uncovered by partial correlations if we could procure series of data for the other factors.

V

For statistics of births in the United States the birth registration area was created in 1915, fifteen years later than the publication of annual deaths from the death registration area. However, we were able to get birth statistics from 1870 to 1920 from the same states from which we obtained mortality statistics. These statistics of birth rates are shown plotted in Chart IV. Looking at this curve we observe that there would be a little more than two cycles if the trend be assumed to be a straight line, which would give little or no correlation with the business cycles. If we assume a trend with two or three bends in it, then we shall get more numerous cyclical fluctuations. The chart shows the trend lines we have fitted.[1] The moving averages of nine years follow very much the same course as these trend lines. The correlation of the fluctuations of the birth rate with the indexes of business is $+0.06$; when the birth rate fluctuations are measured from the line of nine-year moving averages the correlation is $+0.04$. The birth rate for England and Wales likewise fails to show a high positive correlation. When correlated with the amount of foreign trade, the British birth rates, 1874–1910, yield a correlation of -0.31.

One expects a positive correlation between the birth rate and the business cycle, if for no other reason than the fact that there are more marriages in prosperity and fewer in depression. But one also expects such a possible positive correlation to appear by comparing the index

[1] Trends: 1870–90, $y = 23.37 - 0.0836\,x + 0.0196\,x^2$; 1890–1904, $y = 23.93 - 0.219\,x - 0.0041\,x^2$; 1904–20, $y = 25.62 + 0.135\,x - 0.0268\,x^2$.

of the business prosperity not, say, of a particular year with the birth rate of the same year, but with the birth rate of the year following. Making such a correlation on the assumption of a one-year lag, we find for the selected states, 1870–1920, a correlation of $+0.33\pm0.07$; for England and Wales, 1874–1910, it is $+0.15\pm0.11$. Our correlations indicate, therefore, that there is a slight tendency for birth rates to increase in prosperity after a year's lag and to decrease in depression. This may be due in part to the fact that marriages are so highly correlated with business conditions.

VI

It has been said that in periods of acute business depression and unemployment the prisons are filled. In order to measure the correlation between crime and the business cycle records are needed extending over a long period of time. The Secretary of State of New York publishes such a record of the number of convictions for criminal offenses in Courts of Record. Several other states are reported as having such a record, but we have been unable to secure another state record for an unbroken series of years. Regarding these statistics of convictions, Robinson, in his *Criminal Statistics of the United States*, observes that in no state are the records complete. The statistics are sent in from the different local units, but somewhat irregularly. Although the series for New York State is not complete it is the best available, and we decided to compare the fluctuations of this series of crime statistics with the business cycle.

Observation of this curve of crime statistics, as shown in Chart IX, and its fluctuations around the trend line[1] shows that in most of the depressions the number of convictions is above the normal, as indicated by the trend, and in most of the periods of prosperity the number of convictions is less. The coefficient of correlation is -0.35 ± 0.08; when the trend for the data on convictions is for nine-year moving averages the correlation is the same, -0.32. With a one-year lag the coefficient of correlation is smaller, -0.24.

The conclusion that there is an increase in convictions for crime in business depression is corroborated by Davies,[2] who correlated the annual admissions to New York State prisons, 1896–1915, with wholesale prices and found a correlation of -0.41 ± 0.13.

The Secretary of State of New York in his report publishes an analysis of the number of convictions, and one of the series is the number of convictions for offenses against the person, exclusive of offenses against

[1] $y = 331.93 + 12.633 + 1.1035\ x^2 - 1.002512\ x^3 - 0.00138\ x^4$.

[2] *Loc. cit.*, p. 111.

property with violence. It is interesting to inquire whether such offenses against the person are correlated with business conditions. The coefficient of correlation is negative, though small, -0.12 ± 0.09.

Our conclusion is, therefore, that although the records of crime statistics are not wholly satisfactory, there does appear to be some negative correlation between convictions for crime and the business cycle, and this conclusion has been corroborated by another investigation from different data.